Application of Statistical Modelling in Marketing and Advertising

Mindshare Business Planning
7-Nov-12
“Half the money I spend on advertising is wasted. The trouble is I don't know which half.”

- John Wanamaker
1895
Cookie Based Attribution Modeling
It is difficult to measure ROI…

A general but profound E-commerce Formula

ROI =

产品是核心，消费者选择是基础，品牌/服务是增值。
Last click is not everything
Integrated thinking rather than “swim lane” thinking
Digital analytics need to work with technology

All digital data come from cookies. Cookie = Respondent

Internet cookies are small pieces of information in text format that are downloaded to your computer when you visit a web site. With visitor ID, cookie data create a diary of visitor’s online activities (eg. clicks on an ad).

*First party cookie:* cookies come from web site you visited

*Third party cookie:* cookies from ad server:

Chinese Fortune Cookie
Attribution Modeling

• Typical client questions to be addressed by attribution modeling:
  
  • Which elements have driven the conversion – was it the last click, the first click or a particular combination of clicks?
  
  • How can I accelerate this journey by improving the cross-channel efficiency?
Customers interact with online ads multiple times
Attribute sales to every touch points; Not just the last

Bubble size shows number of new customer start their journey; Line width shows cumulative traffic over a journey.
Direct click path to drive multiple business outcomes

- Purchase online
- Cross Purchase
- Purchase next time
- Active Engagement
- Loyalty (active visit + purchase)
- Lifetime value
- Response to offline campaigns
Discover synergy between online media
Customers travel across search and display are more likely to convert

Journey Conversion Rate

<table>
<thead>
<tr>
<th>Customer Group</th>
<th>Search only</th>
<th>Search + Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Journey Conversion Rate</td>
<td>6%</td>
<td>9% (increased by 33%)</td>
</tr>
</tbody>
</table>

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MINDSHARE
Case Study: Consumers start journey further away and finish with brand terms or display

% inside bubble shows conversion rate of customers travelling on particular route.

Customers start with brand PPC or generic PPC then change to display show the highest conversion rate – 19%.
Application Result 1: Individual media plan could gain up to extra 20% sales than we thought
How about mass-media?
How about offline sales?

Marketing Mix Modeling
What is Marketing Mix Modelling?

A brand’s volume sales constantly changes & it changes for a reason

Marketing Mix Modelling is a mathematical approach that explains how each factor drivers sales & share

[Diagram showing various factors affecting sales with arrows indicating changes from Year 2007 to Year 2010]
Mathematical Model

Dependent Variable

Sales (Brand metrics)

Independent variables

ATL
TV, Internet, Print, OOH

BTL
Price promotion, Sampling, gift

Distribution
Number of stores, sales representative

Others
Category Dynamics
Economic Indicators
Innovation
Competition
Seasonality

\[ Y_t = \beta_0 + \sum \beta_k f(X)_{kt} + \epsilon_t \]
Nonlinear model

TV Incremental Volume Response

Threshold

Diminishing Return
Dynamic model

Level of Advertising Impact (Full Impact=1) vs Weeks After Advertising Airing

- Week 1: Peak impact
- Impact decreases over weeks
- Weeks 2-10: Impact continues to decrease but remains above zero
More than a simple linear regression

1. **Non-linear model**
2. **Dynamic model:**
   - incorporating lags, time (t, t-1…) and flexible adstock to include the media carry-over effect, post-promotion dip effect etc
   - Incorporating wear-in, wear-out and different stage of market development
3. **Multivariate model:**
   - Incorporating multivariate relationship between different outcomes and inputs, e.g., TV’s the impact on search and social media, sales’ impact on social media etc
4. **Hierarchical model:**
   - Incorporating hierarchical Bayesian model to address heterogeneity for panel data
An example: Google case
Understanding how offline and online work together to drive sales

MindShare First Direct Google Case Study

Search, Display, Social Media

Direct Effect
Is responsible for 13% of new account applications

Search is responsible for 21% of new account applications

Synergies

Sales

TV, Press, Radio, OOH

Direct Effect
Drives an additional 9% of First Direct Branded searches

Direct Effect
Drives 2% of new account applications
Drives 6% of new account applications

AtL is responsible for 23% of new account applications

Google case study: http://services.google.com/advertisers/uk/first-direct-case-study-final.pdf
Superior methodology results in superior business results

1. Much more reliable strategic recommendation and higher ROI based on accurate measurement of media effectiveness and ROI

2. Media expert: More actionable recommendation, e.g.,
   1. How have cross media (especially TV, digital, OOH, PR) impacted our business? What is the synergy between them? What is the optimal mix?
   2. What is the ROI of different TV channels (PSTV, PTV and LTV), and what is the optimal mix?
   3. What are the recommended weekly/monthly GRP levels for different purpose? Threshold (minimal)? Sweet spot (between maximum marginal response and maximum ROI)? Saturation?
   4. What is optimal mix of GRP level, duration and flight pattern?
   5. What is the effectiveness by campaign/creative?
   6. What is the halo effect? What is the optimal mix of different sub-brands?
   7. How many messages/copies should be on simultaneously?
   8. What is the ROI and optimal mix of different types of message (functional vs emotional)?
   9. What is the right mix of copy lengths (15' vs 30')?
   10. What is the impact of competitors? Optimal SOV?
Addressing Full Marketing Mix

**Price**
- How responsive is my brand to price; what will happen if I raise or lower price by 5%?

**BTL**
- Which promotions make the biggest difference to my business?

**ATL**
- What is my ideal media mix or weight?

**Distribution**
- Does getting an additional 5% distribution really matter when I have 90% already?

**Competition**
- Which competitor activities have really affected my brand?

**Seasonality / Climate**
- How much of an impact does the time of year have on my sales volume?
The effectiveness with which we use media can increase by 12% through a simple reallocation of current budgets.

Current plan (22.3m RMB in Beijing):
- 33% for Product 1
- 17% for Product 2
- 17% for Product 3
- 31% for Product 4
- 2% for Product 5

11.4% increase in unit sales from advertising and 12.1% increase in revenue from media advertising.

Optimized plan (22.3m RMB in Beijing):
- 33% for Product 1
- 20% for Product 2
- 22% for Product 3
- 3% for Product 4
- 3% for Product 5
Media mix optimization

Under the same annual budget the revenue can be improved 5.7% among the incremental sales generated by media. The media adjustment range is from -30% to +30%.

+5.7% in incremental sales by media
Understanding how investments work differently by Tier leads to improved planning

**TV**

<table>
<thead>
<tr>
<th>Tier</th>
<th>Revenue return per RMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>3.2</td>
</tr>
<tr>
<td>Tier II</td>
<td>3.0</td>
</tr>
<tr>
<td>Tier III</td>
<td>2.3</td>
</tr>
</tbody>
</table>

**Discounts**

<table>
<thead>
<tr>
<th>Tier</th>
<th>Revenue return per RMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>0.4</td>
</tr>
<tr>
<td>Tier II</td>
<td>0.5</td>
</tr>
<tr>
<td>Tier III</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Retail**

<table>
<thead>
<tr>
<th>Tier</th>
<th>Revenue return per RMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>1.6</td>
</tr>
<tr>
<td>Tier II</td>
<td>0.9</td>
</tr>
<tr>
<td>Tier III</td>
<td>5.6</td>
</tr>
</tbody>
</table>

**Gifting**

<table>
<thead>
<tr>
<th>Tier</th>
<th>Revenue return per RMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier I</td>
<td>1.3</td>
</tr>
<tr>
<td>Tier II</td>
<td>1.3</td>
</tr>
<tr>
<td>Tier III</td>
<td>2.3</td>
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Beyond ROI
Beyond MMM

1. **Computational advertising**
   - Provide the right product and message to the right consumer in the right time through the right channel
   - Huge data mining, machine learning and optimization problem
   - Ad exchange, Real time bidding, Demand side platform

2. **Consumer and media research**
   - Know what consumer really wants and how to contact them
   - Conjoint analysis, discrete choice modeling, factor analysis, clustering, latent class modeling, structural equation modeling, graphical modeling
An example of RTB
Email: mliao1@yahoo.com
Weibo: 廖明bluedevil